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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/009,704	10/29/2001	Dwight Sherod Walker	PU3682USW	4332

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DAVID J LEVY, CORPORATE INTELLECTUAL PROPERTY
GLAXOSMITHKLINE
FIVE MOORE DR., PO BOX 13398
RESEARCH TRIANGLE PARK, NC 27709-3398

EXAMINER	
GAKH, YELENA G	

ART UNIT	PAPER NUMBER
1743	

DATE MAILED: 04/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

AS

Office Action Summary	Application No.	Applicant(s)	
	10/009,704	WALKER ET AL.	
	Examiner	Art Unit	
	Yelena G. Gakh, Ph.D.	1743	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 February 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7,9-25 and 30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7,9-25 and 30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 October 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☒ Interview Summary (PTO-413) Paper No(s)/Mail Date. *03/310/04*.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Amendment filed on 02/26/04 is acknowledged. Claims 8 and 26-29 are cancelled without prejudice. Claims 1-7, 9-25 and 30 are pending in the application.

Response to Amendment

2. The rejections of the pending claims are not overcome by the amendment and remain as they were established in the previous Office action.

Specification

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. The specification is objected to as not written in such clear and exact terms as to enable any routineer in the art to practice the invention in its best mode. The specification discloses measuring the absorption spectrum of the cryogenic liquid using IR spectroscopy and obtaining the reference cryogenic liquid absorption spectrum. The amendment changed the expression "the absorption spectrum of the cryogenic liquid *having* a first reference energy" to "the absorption spectrum *corresponding* to a first reference energy" (page 2, line 25). This expression is still not clear. Any IR spectrum of any compound contains multiple absorption lines, each corresponding to its own absorption energy, which are due to different vibartional modes of the bonds in functional groups of the molecule. Therefore, there cannot be just one absorption energy for any IR spectrum. The same is true for the "second reference energy". The further disclosure is even less clear, since it is absolutely incomprehensible of how these absorption energies can be divided one over another and as a result allow determination of the concentration of the impurity in the liquid? It is equivalent to dividing one wavelength (or the

frequency) over the other, which does not make any sense. In description of the system of the invention on the same page very clear and correct terms are used for describing the same subject matter, i.e. measuring "absorption intensities" in IR spectra of the reference cryogenic liquid, reference impurity and cryogenic sample having this impurity. The absorption energy of the molecules and intensity (or power) of light are not synonyms and are defined clearly and unambiguously in the art, see e.g. "Fundamentals of Spectrophotometry" in "Quantitative Chemical Analysis" by Harris. It is well known to any routineer in the art that absorption energies define the origin of the molecule, specifically IR absorption energies define vibartional states of the molecular functional groups, and have nothing to do with the concentration of the compound; at the same time intensities of the absorption lines (or changes in the light power, or transmittance) defines the concentration of the compound. It is completely unclear, how dividing a frequency of one compound over the frequency of the other compound allows determining the concentration of the first one in the second? Even less it is clear, how the concentration of one compound in another compound can be determined from the spectra of two pure compounds, with 100% concentration of each of them?

Further, it is not a conventional practice in the art to define chemical compounds, i.e. contaminates or impurities, by their vibartional energies, rather than their chemical formulas (page 6). It is not clear, how any routineer in the art can determine, which compounds are considered impurities in the instant method. Such description does not give a clear and apparent description of the potential contaminants and is inappropriate for a disclosure, which, as it has already been stated lacks clarity in general.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claims 8, 10-25 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter, which was not described

in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. As it is indicated above, the specification does not adequately explain what the first and second reference energies of the absorption spectra of the cryogenic liquid and impurity are, and how it is possible to measure the concentration of the impurity in the sample by using the ratio of these two "reference energies" without any parameters from the sample spectrum involved in the equation?

Claims 8, 16 and 24 recite compounds defined by their vibartional frequencies in Hz, which is not a conventional way for defining compounds and which does not have an adequate description in the specification; therefore these claims are not enabled by the specification.

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

8. Claims 1-25 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites "a method for identifying impurities in a cryogenic liquid", however its steps comprise measuring the spectrum of at least one impurity and **confirming** the presence of **this** impurity in the sample. If it is already known that the specific impurity is present in the sample, then it is not clear, what does this method accomplish? And if the impurity is not known, which impurity should be measured as a reference?

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. **Claims 1-5, 7 and 9** are rejected under 35 U.S.C. 102(b) as being anticipated by Moulson et al. (Nuclear Instruments).

Moulson teaches "monitoring of dopant and impurity concentrations in liquid argon by infrared spectroscopy" (Title) by measuring IR spectra of cryogenic argon (Figure 2), an impurity (volatile organic compound having CH bond, ethylene) alone (Figure 3a) and impurity in the cryogenic liquid (Figure 3b) in a spectrum range 400-4000 cm^{-1} (2500-250 nm) (Figures 1-3) in a flow cell with a pressure drop between 0.85-1.05 bar (~ lb/in^2) (page 278, right column) and confirming the presence of the impurity by comparing the spectrum with the reference spectra of pure argon and ethylene. "" The. cell was originally designed to be combined with a detector used to study the ionization characteristics and electron mobilities of doped liquid argon solutions [7], so that IR analysis of the solutions could be performed *in situ*" (i.e. on-line) (pages 277-278).

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

13. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out

the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

14. **Claim 6** is rejected under 35 U.S.C. 103(a) as being unpatentable over Moulson.

While Moulson does not specifically teach fluorinated hydrocarbons as cryogenic liquids, it would have been obvious for anyone of ordinary skill in the art to apply his method to analyze purification of such compounds, because various applications of e.g. freons require their purification, and Moulson's method is obviously the most convenient for determining their purity.

Response to Arguments

15. Applicant's arguments filed 02/26/04 have been fully considered but they are not persuasive. The reference of Gary Christian in "Analytical Chemistry", which presumably had to justify using the terminology of the applicants in the instant disclosure, does not appear to do so. The reference teaches "relative energy output" for the source of radiation, which obviously depends on the frequency (or wavelength) range of the source. Such "energy output" has nothing to do with the absorption energy of the molecules, and is completely irrelevant to the disclosure of the instant application. Not only the terminology used by the Applicants is confusing and non-conventional, the idea of the method is completely unclear. It is not apparent, how is it possible to determine a concentration of a compound in a fluid (in the instant case in cryogenic liquid) by dividing the frequency of its absorption band (or rather one of its absorption bands) over the frequency of the absorption band of the fluid, which are obtained from absorption spectra of "pure compounds"? Determining concentration of compounds by IR spectroscopy is an old and well-established technique, and is based on calculating transmittance (or reducing the power of light, or intensity of the absorption signal in the spectrum) using the reference with known concentration. The prior art applied to the pending claims discloses exactly such method. The instant application does not provide a comprehensible disclosure of the proposed method, and therefore is objected as not written in clear and definite terms. Regarding defining chemical compounds in terms of their vibrational energies: the examiner did

not reject the units (Hz), in which these vibrational energies are expressed (versus e.g. nm), since it really is not the point of the rejection. The examiner rejected defining chemical compounds through their vibrational energies in general, since this is not a conventional way to define chemical compounds. The conventional way is to give their structural formulas or chemical names, so that it would be clear, which compounds the Applicants consider impurities in their method.

Regarding rejection over the prior art: Moulson specifically and unambiguously disclosed a method for on-line (in-situ) detection, with the citation of the corresponding paragraph from the reference represented above. The fact, that for the specific experiment on-line flow-cell was used for off-line analysis for the purpose of initial conducting the experiments in a simpler environment, does not change the anticipatory character of Moulson's reference.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yelena G. Gakh, Ph.D. whose telephone number is (571) 272-1257. The examiner can normally be reached on 9:30 am - 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill A. Warden can be reached on (571) 272-1267. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Yelena G. Gakh
4/19/04